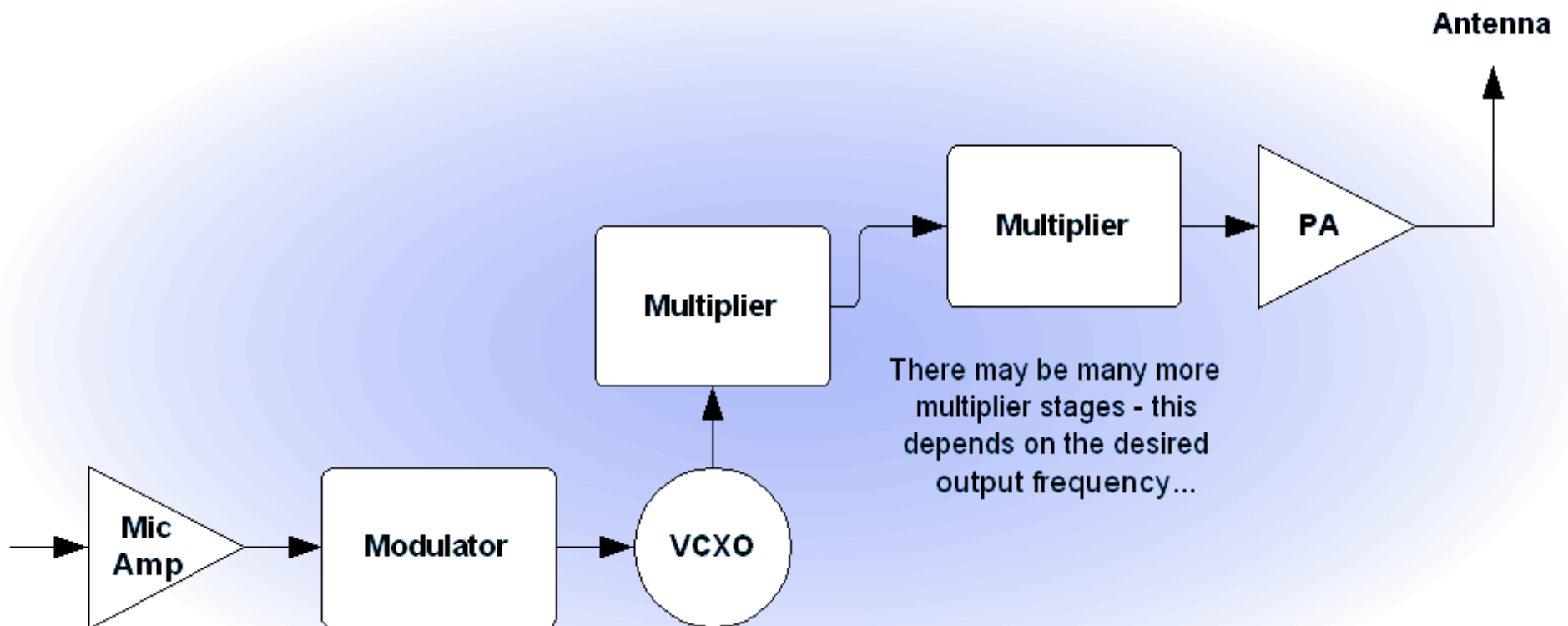


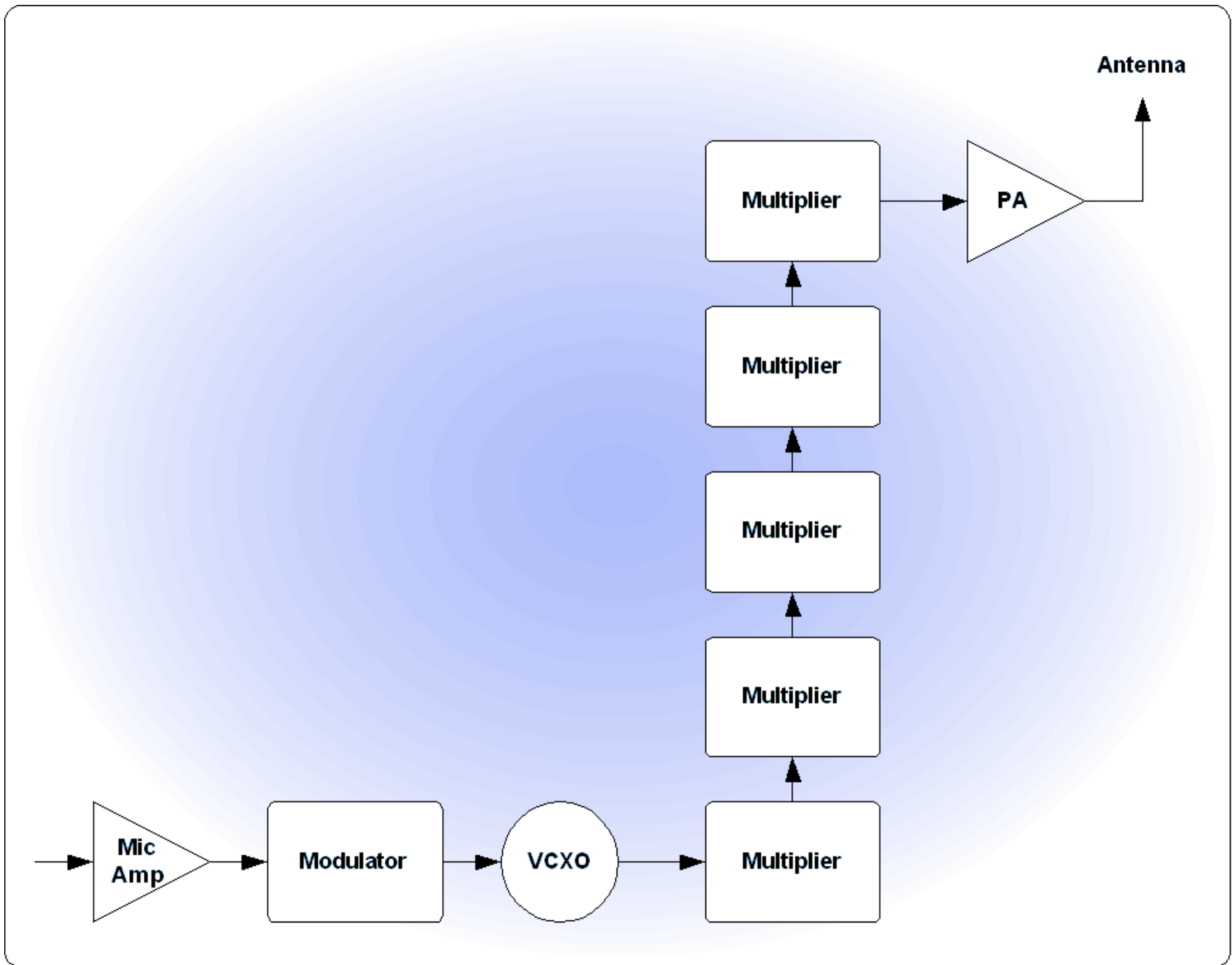


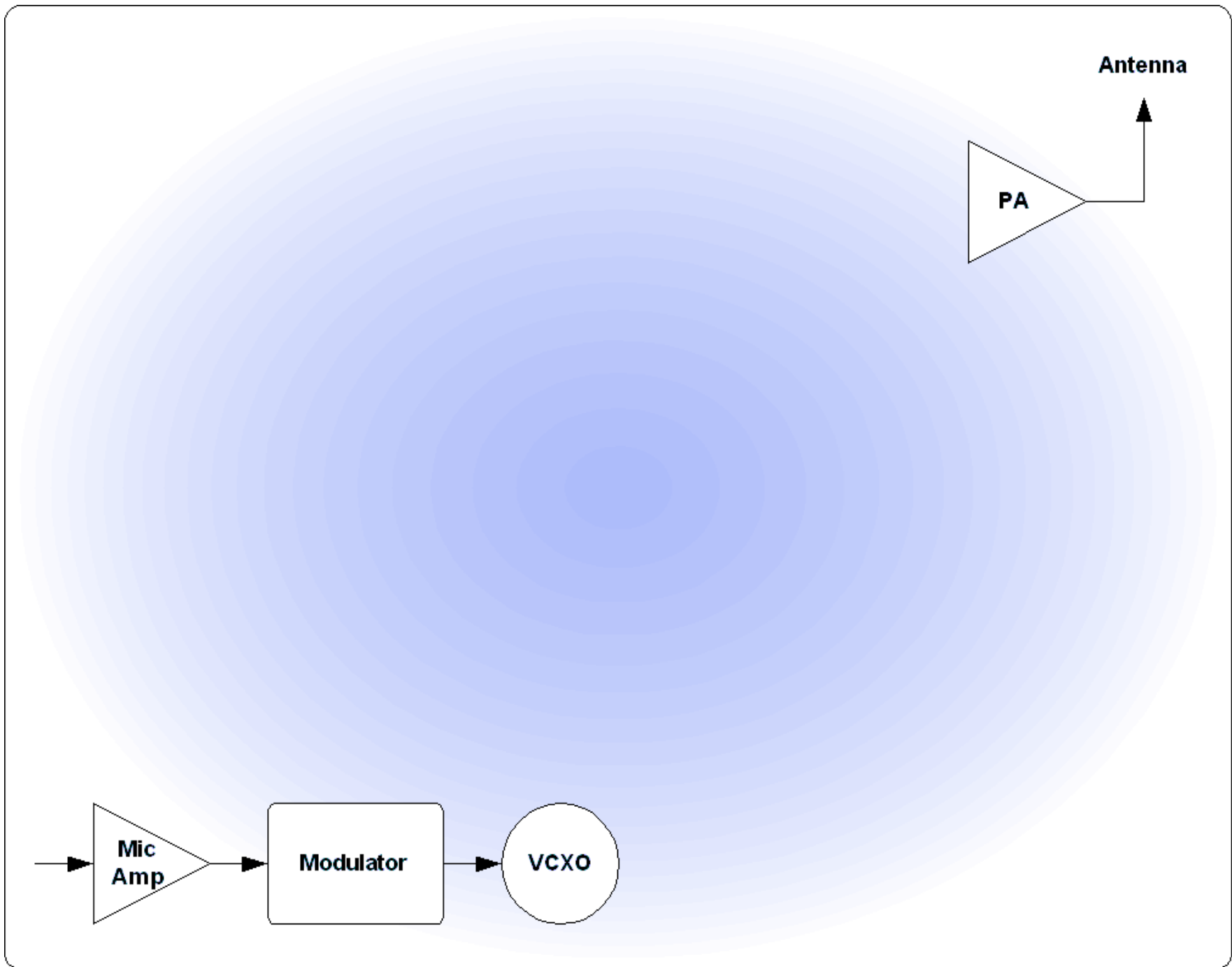
Features

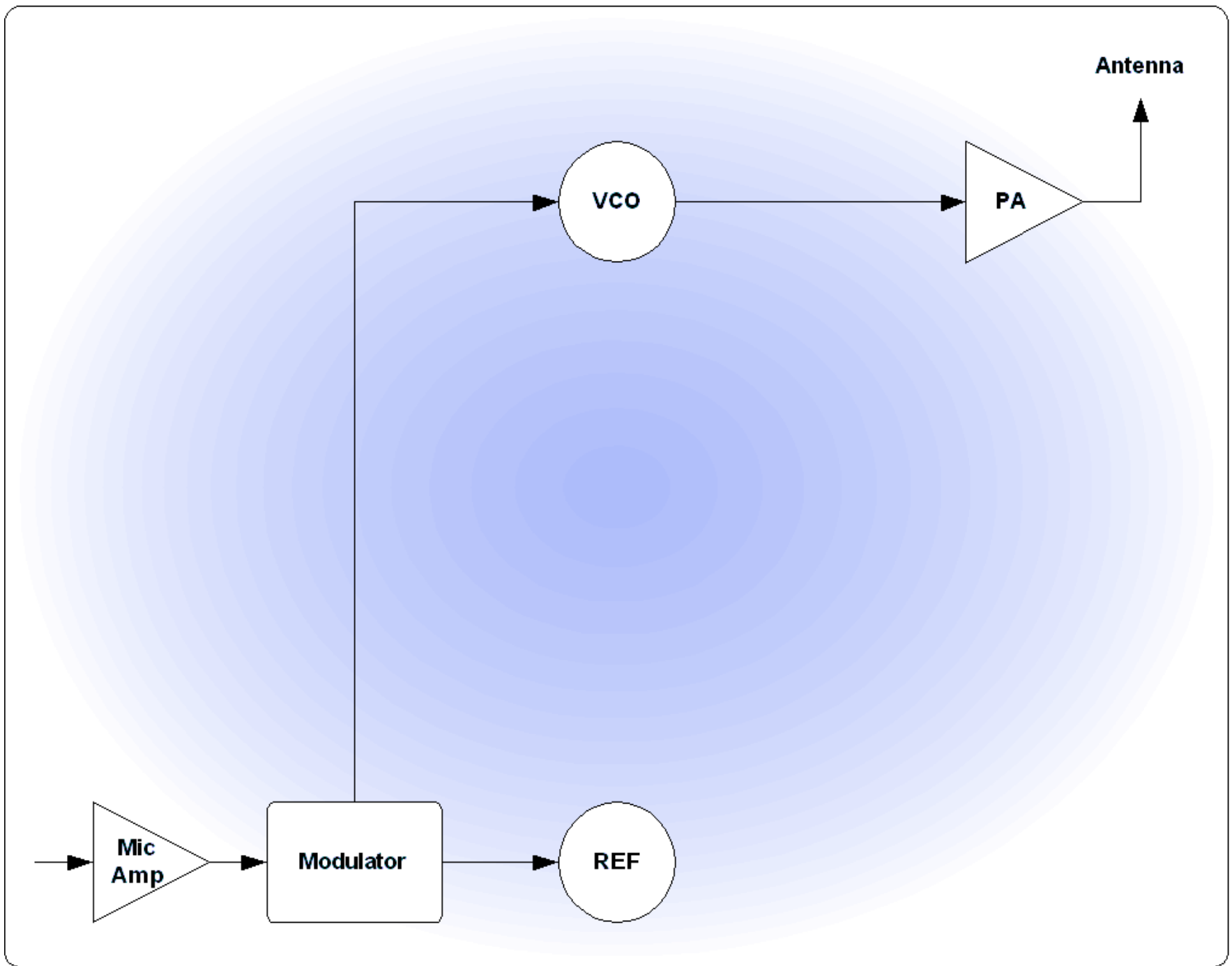
- 400 - 440 MHz
- 2.5 kHz frequency step size
- FM modulated
- 0-7 watts class AB final
- Simple software controls!

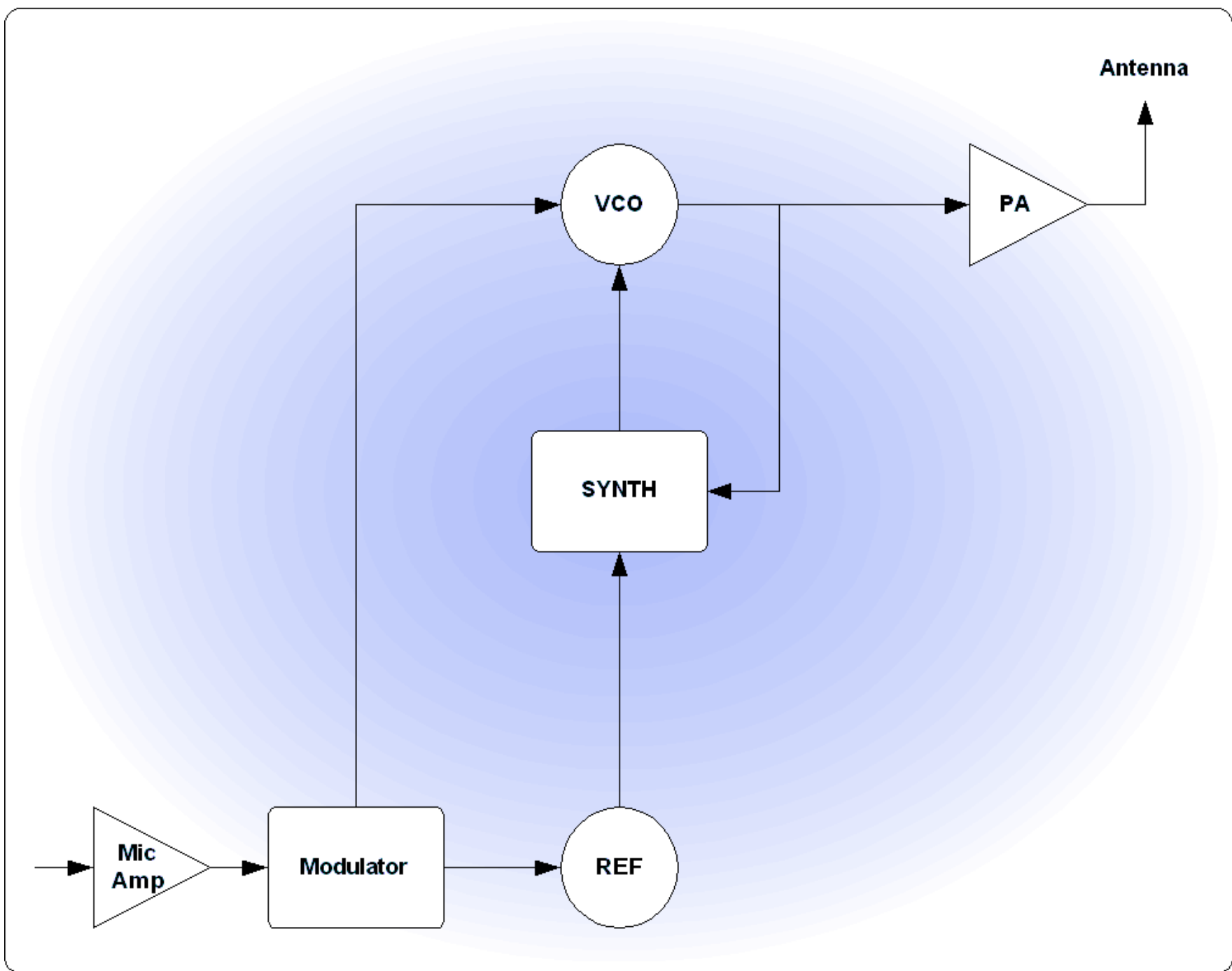
Multiplier Transmitter



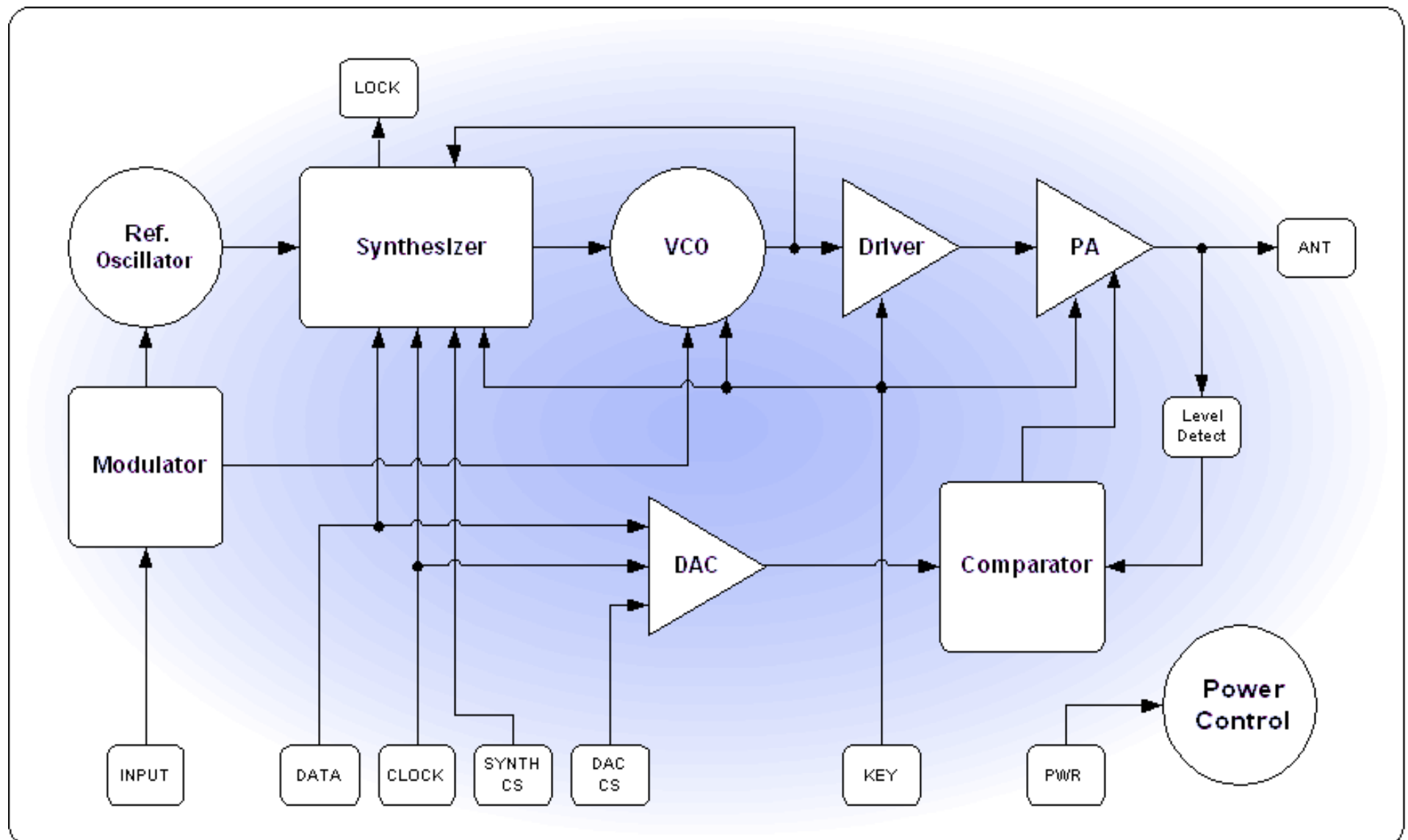




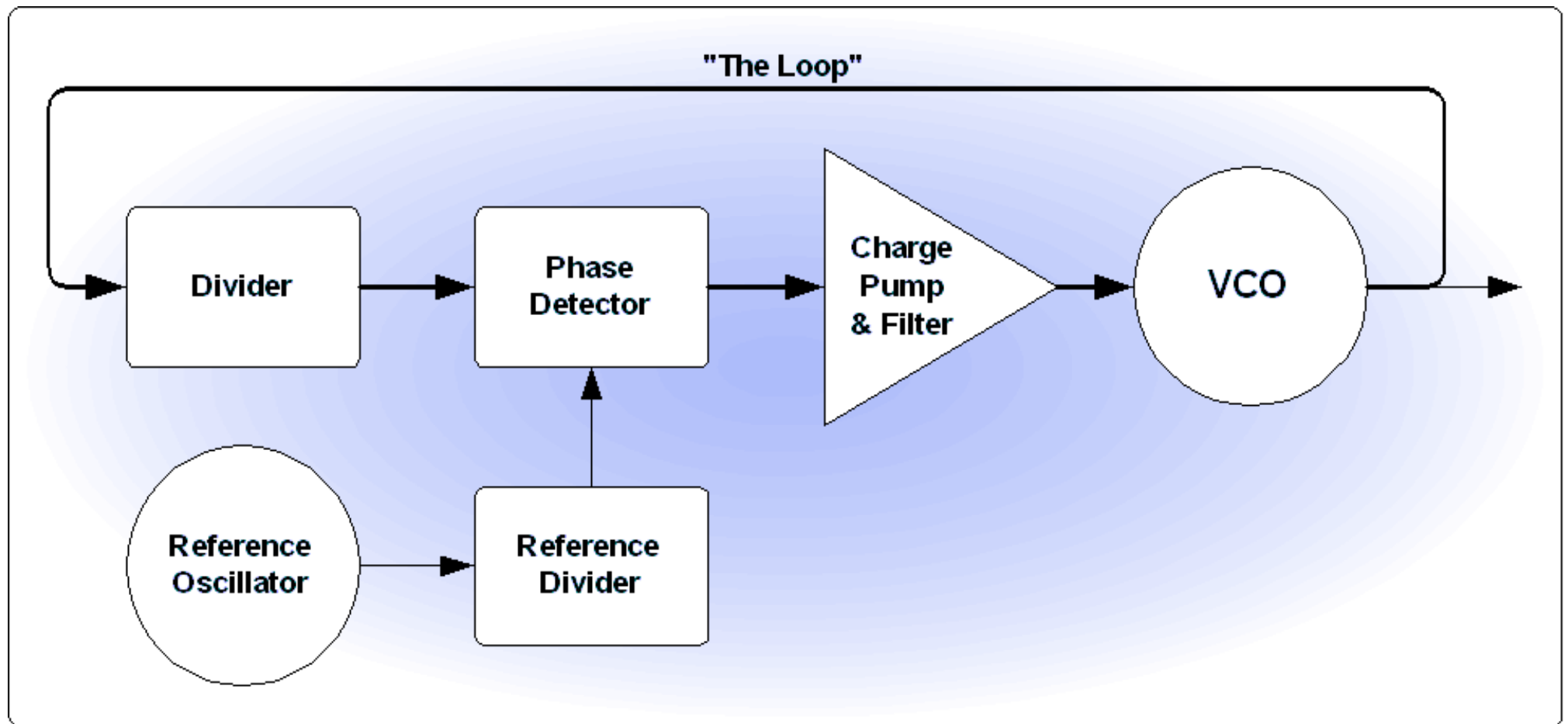




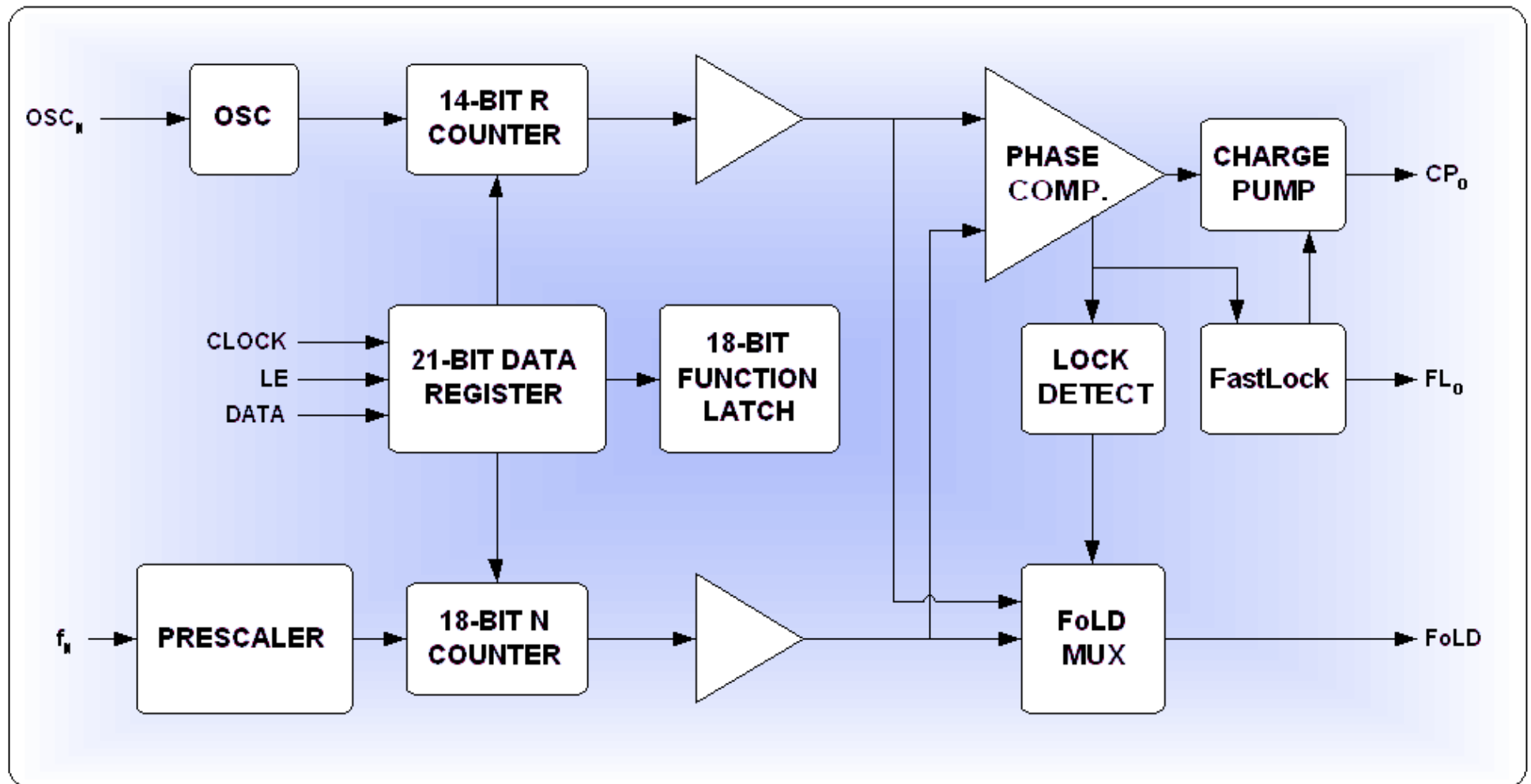
ECHO's Transmitter



Basics of a Synthesizer



LMX2316 Block Diagram



Synthesizer Math

- Simple arithmetic
- Synthesizer attempts to match output of VCO to suit output of reference
- Arithmetic dividers are used to match the frequencies

Synthesizer Registers

- Reference divider
- N divider (A & B)
- Configuration

Reference Divider

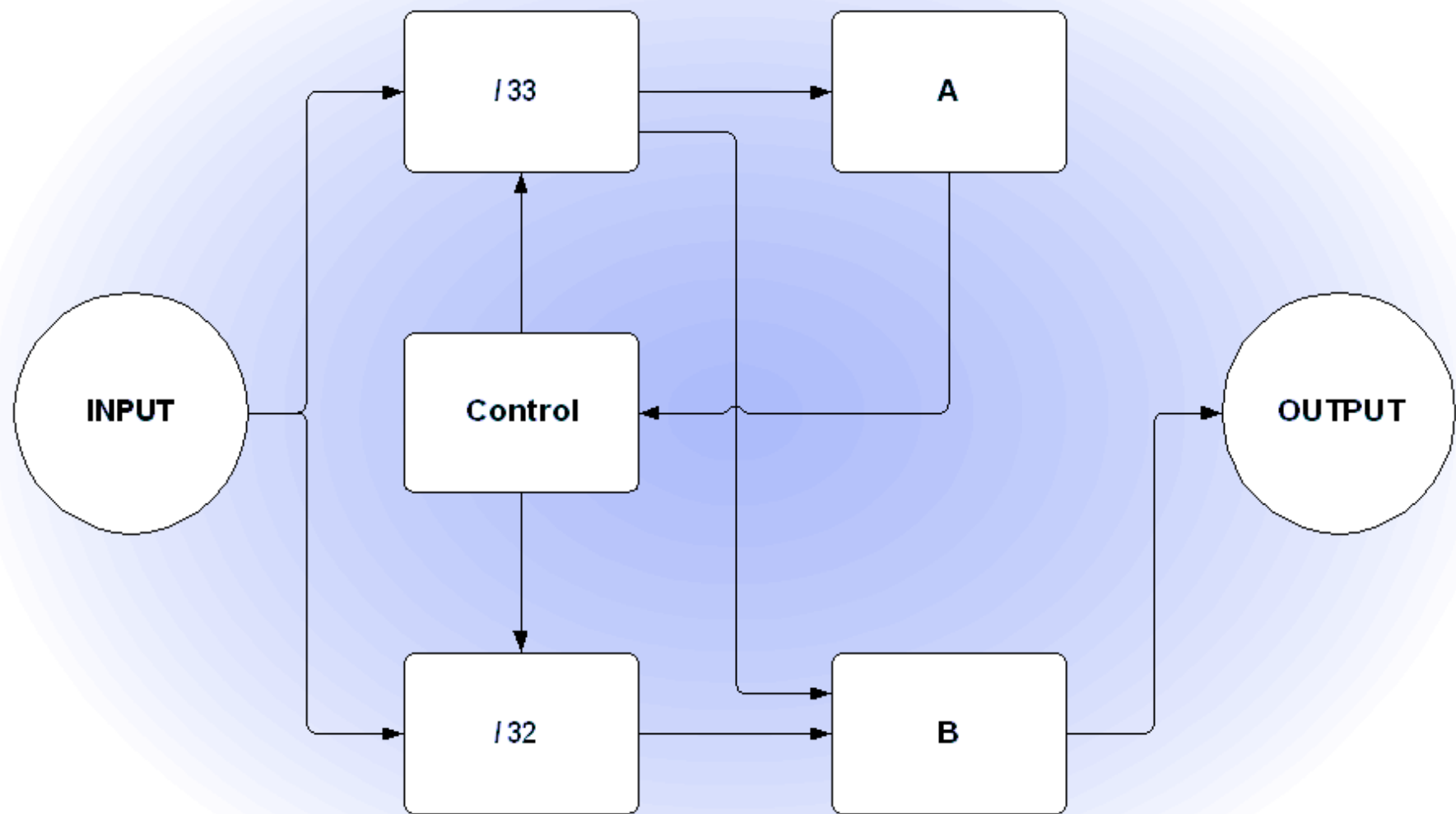
- We need a 2.5 kHz step size - why not use a 2.5 kHz oscillator?
- Not stable - big crystal.
- 10 MHz references are nice and stable.
- So - just divide 10 MHz down to 2.5 kHz.
- LMX2316 has this divider built in.
- Set once after power-up.

N Divider

- Most synthesizers use a prescaler.
- A fixed prescaler limits the synthesizer step size.
- Use a dual-modulus prescaler.
- Divides by 32 part of the time, and by 33 for the rest of the time.
- N is split up into A and B counters.

A & B

- B is decremented every time prescaler counts from either 33 or 32 down to 0 and resets.
- A is decremented every time prescaler counts from 33 down to 0 and resets.
- Prescaler counts from 33 down to 0 until A reaches 0.
- Then it counts from 32 to 0 until B reaches 0.



A & B Division

- Divide 435.225 MHz down to 2.5 kHz
- Figure divisor
 - $435225000 / 2500 = 174090$
- Input to divider is prescaled
 - $174090 / 32 = 5440$ with 10 remaining
 - $B = 5440$
 - $A = 10$

Synthesizer Calculations in Brief		
Crystal Frequency:	10,000,000	Provided by the designer
Frequency Step Size:	2,500	Provided by the designer
Reference Divider:	4,000	Plug this into C1,C2 = (0,0)
Required Frequency:	435,105,000	Must be divisible by step size
Divide Ratio:	174,042	Frequency / Step Size
Prescaler:	32	Provided by the designer
A:	26	Plug this into C1,C2 = (1,0)
B:	5,438	Plug this into C1,C2 = (1,0)
John Teller, N4NUN		